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Frank Chau F Chau & Associates 130 Woodbury Road Woodbury, NY 11797				EXAMINER TYNAN, MATTHEW
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/534,983	HWANG ET AL.	
	Examiner	Art Unit	
	Matthew Tynan	2871	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
 - If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
 - Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) Responsive to communication(s) filed on 21 May 2007.
- 2a) This action is FINAL. 2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) Claim(s) _____ is/are allowed.
- 6) Claim(s) 1-18 is/are rejected.
- 7) Claim(s) _____ is/are objected to.
- 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on 5/21/07 is/are: a) accepted or b) objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) All b) Some * c) None of:
 1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date: _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date: _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Arguments

1. Applicant's arguments filed 5/21/2007 have been fully considered.
2. Regarding the objections to the drawings and the claims, the amendments submitted by the applicant on 5/21/2007 overcome all objections and these are therefore withdrawn.
3. Regarding the rejection of claims 1, 2, and 4-6 under 35 U.S.C. 102(b) as being anticipated by Nishiki et al. (U.S. Patent No. 5,799,812), the applicants arguments are persuasive. Therefore, these rejections are withdrawn.
4. Regarding the rejection of all claims under 35 U.S.C. 103(a), the applicant argues that there is no motivation to combine Woo (U.S. Pub. No. 2002/0122143) and Chang (EP 0827190 A2). These arguments are not persuasive. As discussed in the prior office action, the conductive bump taught by Chang allows a bond to be made with low bonding force, greatly reduces the force tending to separate the connections after bonding, and results in extremely reliable physical and electrical connections between the integrated circuit element and the substrate (Chang, col. 2, lines 29-34). These benefits provide the motivation that would have made it obvious to one of ordinary skill in the art at the time of the invention to modify the teachings of Woo using the conductive bump taught by Chang.
5. On page 12, paragraphs 3 and 4, the applicant argues that the formation of conductive bumps would complicate the manufacturing process and work against the objectives of Woo. This is not persuasive. Even if the manufacturing process became more complex, one of ordinary skill in the art would still be motivated to form the conductive bumps taught by Chang in order to attain more reliable physical and electrical connections. The modification would not

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require the alteration of the transparent gate and data pad links taught by Woo, and therefore would not work against the objective of Woo to provide an optical path so that light can be incident on a photo-hardening sealant applied for bonding the first and second substrates ([0032]).

6. The applicant also argues (pg. 13) that neither Woo nor Chang suggests that the width of the protrusion member should be less than or equal to a width of an electrode of a driving IC chip. However, as shown in Fig. 16 and Fig. 17 of Chang, the protrusion (32) has a width smaller than that of an electrode (26) of the driving IC (30). Though the drawings are not necessarily to scale, the relative sizes of structures in close proximity is ascertainable. The electrodes of the driving IC are shown to overextend the edges of the protrusion. Therefore, one of ordinary skill in the art would understand the drawings to indicate that the width of the protrusion is less than the width of an electrode of the driving IC.

7. Furthermore, Hatada et al. (U.S. Patent No. 5,089,750) suggests the use of an insulating resin for bonding the IC electrodes and the signal electrodes. In this case, the protrusion would be brought into direct contact with the IC electrode. In order to effect the most reliable connection, one of ordinary skill in the art would maximize the contact area between the protrusion and the IC electrode. Because the protrusion is flexible, the contacting surface area of its electrode could change. Therefore, providing an IC driving electrode with a width at least as wide as that of the protrusion would maximize the contact area including any change (increase) in the contact area of the protrusion member.

Drawings

8. The drawings were received on 5/21/2007. These drawings are acceptable.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. Claims 1-13 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Woo et al. (U.S. Pub. No. 2002/0122143) in view of Chang (EP 0827190 A2) and Hatada et al. (U.S. Patent No. 5,089,750).

11. Regarding claim 1, Woo et al. teaches a thin film transistor substrate (21, Fig. 5) comprising:

- A plurality of electrode pads (GP1, GP2, DP1, DP2, etc. Fig. 3) disposed on end portions of gate lines (G1, G2, etc.) and data lines (D1, D2, etc.) to be electrically connected to a driving integrated circuit ([0049], lines 1-2).

12. Woo et al. does not disclose:

- A conductive bump including a protrusion member disposed on the electrode pad with a predetermined thickness and a conductive coating layer disposed on the protrusion member to be electrically connected to the electrode pad, the conductive bump being electrically connected to a driving integrated circuit (IC) using a non-conductive resin, wherein the driving IC applies a predetermined signal to the electrode pad, and wherein a width of the protrusion member is smaller than or equal to a width of the electrode of the driving IC.

13. However, Chang discloses a conductive bump (Fig. 1A) including a protrusion member (32) disposed on the electrode pad (26) with a predetermined thickness and a conductive coating layer (36) disposed on the protrusion member, the conductive bump being electrically connected to the electrode pad, the conductive bump being electrically connected to a driving IC (col. 2, lines 37-39), and wherein a width of the protrusion member (32) is smaller than or equal to a width of the electrode of the driving IC (see Fig. 15). This configuration allows a bond to be made with low bonding force, greatly reduces the force tending to separate the connections after bonding, and results in extremely reliable physical and electrical connections between the integrated circuit element and the substrate (col. 2, lines 29-34).

14. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the device taught by Woo et al. using the conductive bump taught by Chang in order to create, for instance, extremely reliable physical and electrical connections between the integrated circuit element and the substrate.

15. Chang suggests bonding can be done using a non-conductive adhesive between the IC and the substrate (abstract, lines 13-16).

16. Hatada et al. suggests that the use of an insulating resin for providing the connection between the IC and the substrate prevents leakage between adjacent leads and adjacent electrodes so that the pitch of the electrodes may be reduced (col. 2, lines 8-12).

17. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the device taught by Woo et al. and Chang using the non-conductive resin taught by Hatada et al. in order to prevent leakage between adjacent electrodes.

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18. In this case, the protrusion would be brought into direct contact with the IC electrode. In order to effect the most reliable connection, one of ordinary skill in the art would maximize the contact area between the protrusion and the IC electrode. Because the protrusion is flexible, the contacting surface area of its electrode could change. Therefore, providing an IC driving electrode with a width at least as wide as that of the protrusion would maximize the contact area including any change (increase) in the contact area of the protrusion member.

19. Therefore, claim 1 is unpatentable.

20. Regarding claim 2, Chang teaches the protrusion member (32, Fig. 1A) is disposed on the electrode pad (26) such that a peripheral portion of the electrode pad is exposed.

21. Therefore, claim 2 is unpatentable.

22. Regarding claim 3, Chang teaches that the protrusion member comprises and embossing pattern on an upper surface thereof (Fig. 3).

23. Therefore, claim 3 is unpatentable.

24. Regarding claim 4, Chang teaches that the protrusion member (32) comprises a plurality of projections (Fig. 4) spaced apart by a predetermined distance, a portion of the electrode pad being exposed through a space between the projections.

25. Therefore, claim 4 is unpatentable.

26. Regarding claim 5, Woo et al. teaches forming a gate line (G1), a data line (D1), and a plurality of electrode pads (GP1, DP1) disposed on the end portions of the gate and data lines.

27. Woo does not teach forming a conductive bump including a protrusion member disposed on the electrode pad with a predetermined thickness and a conductive coating layer disposed on the protrusion member to be electrically connected to the electrode pad, the conductive bump

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being electrically connected to an electrode of a driving integrated circuit (IC) that applies a predetermined signal to the electrode pad by using a non-conductive resin.

28. However, Chang discloses a conductive bump (Fig. 1A) including a protrusion member (32) disposed on the electrode pad (26) with a predetermined thickness and a conductive coating layer (36) disposed on the protrusion member, the conductive bump being electrically connected to the electrode pad, the conductive bump being electrically connected to a driving IC (col. 2, lines 37-39), and wherein a width of the protrusion member (32) is smaller than or equal to a width of the electrode of the driving IC (see Fig. 15). This configuration allows a bond to be made with low bonding force, greatly reduces the force tending to separate the connections after bonding, and results in extremely reliable physical and electrical connections between the integrated circuit element and the substrate (col. 2, lines 29-34).

29. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the device taught by Woo et al. using the conductive bump taught by Chang in order to create, for instance, extremely reliable physical and electrical connections between the integrated circuit element and the substrate.

30. Chang suggests bonding can be done using a non-conductive adhesive between the IC and the substrate (abstract, lines 13-16).

31. Hatada et al. suggests that the use of an insulating resin for providing the connection between the IC and the substrate prevents leakage between adjacent leads and adjacent electrodes so that the pitch of the electrodes may be reduced (col. 2, lines 8-12).

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32. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the device taught by Woo et al. and Chang using the non-conductive resin taught by Hatada et al. in order to prevent leakage between adjacent electrodes.

33. In this case, the protrusion would be brought into direct contact with the IC electrode. In order to effect the most reliable connection, one of ordinary skill in the art would maximize the contact area between the protrusion and the IC electrode. Because the protrusion is flexible, the contacting surface area of its electrode could change. Therefore, providing an IC driving electrode with a width at least as wide as that of the protrusion would maximize the contact area including any change (increase) in the contact area of the protrusion member.

34. Therefore, claim 5 is unpatentable.

35. Regarding claim 6, Chang teaches forming the conductive bump by:

- Forming a photoresist organic layer (32) on the electrode pad (26; see Fig. 9B).
- Patterning the photoresist organic layer to form a protrusion member (Fig. 9C).
- Forming a conductive layer covering the protrusion member (Fig. 9D).
- Patterning the conductive layer to form a conductive coating layer on the protrusion member, the conductive coating layer being electrically connected to the electrode pads (Fig. 9E).

36. Therefore, claim 6 is unpatentable.

37. Regarding claim 7, Woo et al. discloses an LCD apparatus including a pixel region (A, Fig. 6) having a plurality of thin film transistors (claim 12, lines 1-2), including a pad region (P, Fig. 6) having a plurality of electrode pads, the LCD apparatus comprising:

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- An LCD panel ([0048], line 1) including a TFT substrate (61, shown in Fig. 6 and 7), a color filter substrate (61a) and a liquid crystal layer (LC) interposed between the TFT substrate and the color filter substrate.
- A driving IC electrically connected to the electrode pad ([0049], lines 1-2).
- An adhering member (ACF, [0052], line 4) adhering the driving IC to the electrode pads (GP1, DP1, etc.).

38. Woo et al. does not teach a protrusion member, a conductive bump disposed on the protrusion member, the conductive bump having a conductive coating layer that is electrically connected to the electrode pad.

39. However, Chang teaches a protrusion member (32), a conductive bump disposed on the protrusion member (see Fig. 1A), the conductive bump having a conductive coating layer (36) that is electrically connected to the electrode pad (26).

40. This configuration allows a bond to be made with low bonding force, greatly reduces the force tending to separate the connections after bonding, and results in extremely reliable physical and electrical connections between the integrated circuit element and the substrate (col. 2, lines 29-34).

41. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the device taught by Woo et al. using the conductive bump taught by Chang in order to create, for instance, extremely reliable physical and electrical connections between the integrated circuit element and the substrate.

42. Hatada et al. suggests that the use of an insulating resin for providing the connection between the IC and the substrate prevents leakage between adjacent leads and adjacent electrodes so that the pitch of the electrodes may be reduced (col. 2, lines 8-12).

43. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the device taught by Woo et al. and Chang using the non-conductive resin taught by Hatada et al. in order to prevent leakage between adjacent electrodes.

44. In this case, the protrusion would be brought into direct contact with the IC electrode. In order to effect the most reliable connection, one of ordinary skill in the art would maximize the contact area between the protrusion and the IC electrode. Because the protrusion is flexible, the contacting surface area of its electrode could change. Therefore, providing an IC driving electrode with a width at least as wide as that of the protrusion would maximize the contact area including any change (increase) in the contact area of the protrusion member.

45. Therefore, claim 7 is unpatentable.

46. Regarding claim 8, Chang teaches the protrusion member comprises an elastic organic material (col. 2, lines 28-29) so that the conductive bump is compressed by a distance when the driving IC is pressed down and is restored corresponding to the distance when the driving IC is released, thereby maintaining an electrical connection between the conductive bump and the driving IC. Because the protrusion member comprises an elastic organic material, it inherently has the property that pressure will compress it, but upon release of that pressure, the protrusion will be restored.

47. Therefore, claim 8 is unpatentable.

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48. Regarding claim 9, Chang teaches the protrusion member (32, Fig. 1A) is disposed on the electrode pad (26) such that a peripheral portion of the electrode pad is exposed.

49. Therefore, claim 9 is unpatentable.

50. Regarding claim 10, Chang teaches that the protrusion member comprises and embossing pattern on an upper surface thereof (Fig. 3).

51. Therefore, claim 10 is unpatentable.

52. Regarding claim 11, Chang teaches that the protrusion member (32) comprises a plurality of projections (Fig. 4) spaced apart by a predetermined distance, a portion of the electrode pad being exposed through a space between the projections.

53. Therefore, claim 11 is unpatentable.

54. Regarding claim 12, Hatada et al. suggests that the use of an insulating resin for providing the connection between the IC and the substrate prevents leakage between adjacent leads and adjacent electrodes so that the pitch of the electrodes may be reduced (col. 2, lines 8-12). Hatada et al. further teaches that the non-conductive resin may be applied by pressing the electrodes one to another (col. 3, lines 28-32) and by applying heat (col. 3, 36-37).

55. Therefore, claim 12 is unpatentable.

56. Regarding claim 13, Regarding claim 13, Woo et al. forming an LCD apparatus including a pixel region (A, Fig. 6) having a plurality of thin film transistors (claim 12, lines 1-2), including a pad region (P, Fig. 6) having a plurality of electrode pads, the method comprising:

- Forming a TFT substrate (61, shown in Fig. 6 and 7).
- Forming a color filter substrate (61a).

- Forming a liquid crystal layer (LC) interposed between the TFT substrate and the color filter substrate.
- A driving IC electrically connected to the electrode pad ([0049], lines 1-2).

57. Woo et al. does not teach a protrusion member, a conductive bump disposed on the protrusion member, the conductive bump having a conductive coating layer that is electrically connected to the electrode pad.

58. However, Chang discloses a conductive bump (Fig. 1A) including a protrusion member (32) disposed on the electrode pad (26) with a predetermined thickness and a conductive coating layer (36) disposed on the protrusion member, the conductive bump being electrically connected to the electrode pad, the conductive bump being electrically connected to a driving IC (col. 2, lines 37-39) and wherein a width of the protrusion member (32) is smaller than or equal to a width of the electrode of the driving IC (see Fig. 15). This configuration allows a bond to be made with low bonding force, greatly reduces the force tending to separate the connections after bonding, and results in extremely reliable physical and electrical connections between the integrated circuit element and the substrate (col. 2, lines 29-34).

59. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the device taught by Woo et al. using the conductive bump taught by Chang in order to create, for instance, extremely reliable physical and electrical connections between the integrated circuit element and the substrate.

60. Hatada et al. suggests that the use of an insulating resin for providing the connection between the IC and the substrate prevents leakage between adjacent leads and adjacent electrodes so that the pitch of the electrodes may be reduced (col. 2, lines 8-12).

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61. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the device taught by Woo et al. and Chang using the non-conductive resin taught by Hatada et al. in order to prevent leakage between adjacent electrodes.

62. In this case, the protrusion would be brought into direct contact with the IC electrode. In order to effect the most reliable connection, one of ordinary skill in the art would maximize the contact area between the protrusion and the IC electrode. Because the protrusion is flexible, the contacting surface area of its electrode could change. Therefore, providing an IC driving electrode with a width at least as wide as that of the protrusion would maximize the contact area including any change (increase) in the contact area of the protrusion member.

63. Therefore, claim 13 is unpatentable.

64. Regarding claim 18, Hatada et al. suggests that the use of an insulating resin for providing the connection between the IC and the substrate prevents leakage between adjacent leads and adjacent electrodes so that the pitch of the electrodes may be reduced (col. 2, lines 8-12). Hatada et al. further teaches that the non-conductive resin may be applied by pressing the electrodes one to another (col. 3, lines 28-32) and by applying heat (col. 3, 36-37).

65. Therefore, claim 18 is unpatentable.

66. Claims 14-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Woo et al., Chang, and Hatada et al. as applied to claim 13 above, and further in view of Park et al. (U.S. Patent No. 6,380,559).

67. Regarding claim 14, the combination of Woo et al., Chang, and Hatada et al. teaches:

- Forming an insulating film (Woo et al. 83, Fig. 7-8) on the entire surface of the substrate (61), including the pixel and pad regions.

- Patterning the insulation layer to form an insulating layer in the pixel region (Woo et al.) and patterning a photoresist organic layer to form a protrusion member (32, Chang) in the pad region (Chang).
- Forming a conductive layer (36, Chang; and [0070], lines 1-5, Woo et al.) over the insulating layer and the protrusion member.
- Patterning the conductive layer (36, Chang; and [0070], lines 1-5, Woo et al.) to form a pixel electrode (Woo et al., [0061], lines 2-3) and a conductive coating layer on the protrusion member (Woo et al., [0061], lines 1-5, and Chang 36).

68. The combination of Woo et al. and Chang is silent regarding the material used for the insulating film.

69. However, Park et al. teaches that an insulation film can be replaced by a photosensitive organic layer (80), which avoids processing of a separate photoresist layer to pattern the insulation layer, thus simplifying the manufacturing process (col. 17, lines 64-67).

70. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the device taught by Woo et al. and Chang by using a photoresist organic layer to provide the insulation layer as taught by Park et al. in order to simplify the manufacturing process.

71. Therefore, claim 14 is unpatentable.

72. Regarding claim 15, Woo et al. teaches that the conductive layer (63) of the electrode pads should be ITO, because such a material has better adhesive properties than a metal ([0052]).

73. Therefore, claim 15 is unpatentable.

74. Regarding claim 16, Chang teaches the conductive layer (36) comprises a metal (col. 4, lines 1-5). Chang teaches that multiple layers of metal may be used, each to increase adhesiveness, to increase conductivity, and to act as a barrier layer (col. 4, lines 50-56). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a metal layer to increase adhesiveness, conductivity, or to act as a barrier.

75. Therefore, claim 16 is unpatentable.

76. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination applied to claim 14 above, and further in view of Komatsu (U.S. Patent No. 6,384,888).

77. Regarding claim 17, the combination above teaches the use of a single metal layer, as discussed above regarding claim 16. The combination does not teach a stack including a first layer of ITO or IZO and a second layer including metal.

78. However, Komatsu teaches that the material of the pad region includes three layers, including two of metal and one of ITO. The layer of ITO prevents the oxidation of the lower metal layers, and thus reduces the contact resistance between the electrode pads and the driving circuits (col. 5, lines 7-16).

79. It would have been obvious to one of ordinary skill in the art at the time the invention was made to cover a metal layer taught by Chang such as in re claim 16 using the ITO layer taught by Komatsu in order to prevent oxidation and to reduce contact resistance between the electrode pads and the driving circuits.

80. Therefore, claim 17 is unpatentable.

Conclusion

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10. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew Tynan whose telephone number is 571-270-1433. The examiner can normally be reached on Mon-Fri. 7:30-4pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Nelms can be reached on 571-272-4491. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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UT



ANDREW SCHECHTER
PRIMARY EXAMINER